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(54) Title: **METHOD FOR DETECTION OF MUTATIONS IN DNA**

(57) **Abstract:** A method for the detection in a given DNA sequence of DNA mutations, single nucleotide polymorphisms, and insertions and deletions, said method comprising the step of a) producing replicate(s) with an engineered polymerase of said given DNA sequence with part or all of at least one of the four natural DNA bases exchanged against a not natural base; b) using said not natural base to cleave the replicate(s) obtained in step a) and to produce a DNA product presenting sequence-specific fragments; c) analyzing said sequence-specific fragments obtained in step b) by mass spectrometry to get sequence-specific fragment patterns; and d) using the sequence-specific fragment patterns obtained in step c) to identify sequence changes relative to a reference to said given DNA sequence. A kit for the detection of DNA mutations, single nucleotide polymorphisms, and insertions and deletions.